

BIOL-3671-WA

Evolutionary Concepts

Course Outline – Winter 2020

This course is designed to provide a thorough understanding of evolutionary concepts and their application to important questions in biology, with an emphasis on ecology. Course instruction will include a mixture of lectures, tutorials, and an investigative assignment. Lectures will emphasize conceptual, empirical, and experimental approaches to the study of evolution. Tutorials will reinforce lecture topics. Topics include mechanisms of evolution, adaptation, speciation and an introduction to evolutionary ecology.

Text:

Morris, D. W., and Lundberg, P. 2011. *Pillars of Evolution: Fundamental Principles of the Evolutionary Process*. Oxford University Press, New York. 272 pp.

Instructor:

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CB 3023

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Office hours: Wednesdays

1:00 PM – 3:00 PM (otherwise by appointment)

Graduate assistants:

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Evaluation:

- Tutorials (8 out of 10) (8 x 5%) = 40%
- In class quizzes (4 out of 5) (4 x 10%) = 40%
- Term assignment (1 x 20%) = 20%

Note: Best 9 out of 10 and 4 out of 5 marks for tutorial exercises and quizzes respectively will be applied to the final mark. This should be used as an insurance policy against unforeseen circumstances only. Missing tutorials or quizzes for non-medical reasons will not be excused.

Lectures – Thursdays (5:30 PM – 7:00 PM) RC 0005

Lecture topics will follow the structure of the text and for this reason weekly reading of the associated chapters is recommended. Two weeks will be dedicated to each of the five pillars of evolution: Mechanics, Function, Structure, Scale, and Dynamics. The final week will see the synthesis of these five topics and how they contribute to drive adaptive evolution and contribute to the diversity of life.

Tutorials – Various times CB 3010A

Tutorials are designed to reinforce the major topic(s) of the previous week's lecture. This will allow students to learn the key concepts in depth through in-class exercises and discussion of academic papers that revolve around the current week's topic. Each in-class assignment contributes to the final course mark. In addition to this, students are also provided a chance to work on current components of the final term assignment (see below for details). For this reason, attendance to all tutorial sessions is strongly recommended.

Term paper – Due 11:59 PM, Friday April 3, 2020

The goal of this project is for students to show a comprehensive understanding of how evolution is the result of multiple mechanisms and processes working simultaneously and at various temporal and spatial scales i.e. the five pillars of evolution. Students should keep this project in mind throughout the course, making notes and gathering resources as the term progresses.

Students will be required to choose one organism (or unique group of organisms) and show how their current state (form, function, distribution, abundance, etc.) is the result of the five pillars of evolution. Any living organism is acceptable; as long as it undergoes DNA replication. Through the use of peer-reviewed literature, the paper will highlight how each of the five pillars shaped the organism(s) into their current state (or most recent state if they are extinct). Some pillars may be more influential than others and will require more thorough discussion in the paper; nevertheless they must all be addressed at some point. Regular attendance to lectures and tutorials will facilitate this, especially if the focal organism is chosen early on in the term.

Term paper format

Papers should be typed using 12-point font, and double-spaced with an approximate length of 6-10 pages. It should include a cover page that has an attention grabbing title, your name, student number, and the date. There is no strict layout for the paper but it should include an introduction to the organisms including physical description, where it is found (geography, habitat preference,

general climate, etc.), its abundance (common or rare), and any interesting ecological facts (apex predator, ecosystem engineer, keystone species, etc.).

The body will consist of how evolutionary forces have shaped its current state described in the introduction. This will require research into a variety of sources from multiple disciplines, including genetics, biogeography, and ecology. Use subsections to improve the flow and clarity of the paper. It is understood that some organisms have been studied more extensively than others; do not hesitate to ask the instructor or GA's for help finding relevant sources of literature. Similarly, resource sharing amongst classmates is encouraged, so long as the final product is of your own writing.

The paper should conclude with predictions as to how (or if) the organism will adapt to a changing environment. Our global climate is changing rapidly and some habitats will undergo drastic changes. These changes will occur quickly relative to an evolutionary timescale (10-500 yrs). Does your organism possess any traits that would allow it to adapt? Is it capable of migrating to more favourable habitats? Can it compete with other species that may invade its range as they shift their own habitat? Is it so specialized to a particular habitat that it faces extinction? Are there any specific measures humans could take to conserve their status? Feel free to make predictions on any potential evolutionary pathway your organism may follow.

Finally, a literature cited page should be included at the end. Only peer reviewed materials or those from credited government agencies should be used (minimum 7). If you have not done so already, familiarize yourself with use of the Web of Science database - it is an excellent source of peer reviewed material from all scientific disciplines. The library help desk can assist you if needed.

Term paper marking criteria:

Introduction	20%
Body	40%
Conclusion	20%
Writing quality/Formatting (Grammar, spelling, organization, proper citations)	10%
Sources used (Quality, variety, relevance)	10%
Total	100%

Mark will be converted to 20% of the final mark. Any papers suspected to be plagiarized will be given a mark of zero, as per the "Code of Student Behaviour and Disciplinary Procedures". A copy of the document may be obtained from the Registrar's Office or online.